

JENAM 2010 – Lisbon, Portugal, September 6 -7, 2010

Symposium 2: Environment and the Formation of Galaxies: 30 years later

Eduardo Amores

Title: *Simulations of star counts and galaxies towards VVV survey region*

Authors: *Eduardo Amores , Nelson Padilla, Laerte Sodre, Dante Minniti, Beatriz Barbay for the VVV collaboration*

Abstract : *Vista Variables In The Via Lactea (VVV) is an ESO variability survey (<http://www.vvvsurvey.org>) that is performing observations in near infrared bands (J,H,K,Y and Z) towards the galactic bulge and part of the disk. It is observing not only galactic objects but also extragalactic objects (galaxies and QSO's) despite the large extinction of up to $A_V < 30$ mag in the galactic plane. One of the ways to identify/separate galaxies from stars is based on the analysis of the color-color and color-magnitude diagrams that allow us to identify stellar/galaxy loci in those diagrams. In the present work, we present results of simulations for star and galaxy counts using a Galaxy and Large-Scale Structure Model (respectively) towards VVV survey region. In total there are around 3 billions and 2 millions of simulated stars and galaxies, respectively, up to the survey limiting magnitude. Those simulations were performed using the most recent and realistic extinction models. In the case of the galaxy simulations, these come from the semi-analytic galaxy formation model of Bower et al. (2006) applied to the Millennium simulation (Springel et al., 2006). Our results consist of color-color and color-magnitude diagrams in the space of the colors (JHKYZ) for stars and galaxies. They also include the expected observed distribution of background galaxies, as well as the expected number of stars that will be observed by VVV in any range of magnitude, colors, spectral types and distances for each galactic component (disk, bulge and halo), which is also useful for several VVV projects.*

Caroline Anthony

Title: *SDSS/GALEX Mergers and their Environments as Probes of Galaxy Formation and Evolution*

Authors: *Caroline Anthony, Sugata Kaviraj*

Abstract : *Mergers are fundamental to the standard hierarchical paradigm of galaxy formation. They produce intense star formation episodes, driving the build-up of stellar mass and black holes and alter the morphological mix of the universe. While they are routinely included in galaxy formation models, the evolution of star formation and AGN activity has not been fully explored from a purely observational perspective. I have used observational evidence using SDSS and GALEX data to test currently accepted models of galaxy evolution by analysing galaxy closepairs drawn from the SDSS (using code which picks out nearby/interacting galaxies using their angular separation and spectroscopic redshift difference). UV and optical photometry is used to estimate the recent star formation in close pair systems as a function of separation, galaxy properties (eg. morphology and luminosity) and global environment. SDSS spectra is used to probe the properties of AGN in the*

merging systems and the interplay between star formation and AGN activity is studied using a large homogeneous dataset. The results provide constraints on our current theoretical infrastructure and provide a picture of how merging affects galaxy evolution from an observational perspective using state-of-the-art spectro-photometric data from current large-scale observational surveys.

Katerina Bartoskova

Title: *Simulations of shell galaxies with GADGET-2: the influence of dark matter profiles on the distribution of shells*

Authors: *Katerina Bartoskova, Bruno Jungwiert, Ivana Ebrova, Lucie Jilkova, Miroslav Krizek*

Abstract : *The process of creation of shell galaxies can contribute to probing dark matter distribution in elliptical galaxies. In this poster we present N-body simulations of a minor merger using the code GADGET-2. Self-consistent simulations of a head-on collision reveal merger remnants in the form of a shell galaxy. Because of the self-consistent treatment of the gravity, the effects of dynamical friction and the tidal forces are naturally present. These were not involved in most previous simulations of shell galaxies. Inner shells are also detected, in agreement with observations. However, the shell distribution depends on the chosen mass distribution of the primary massive galaxy. We select various combinations of two-component models (stars and dark matter) for the primary elliptical galaxy, taking into account current constraints on dark matter models. Such a study was never done in great detail before. We discuss the differences in resulting shell structures.*

Verena Baumgartner

Title: *Ram pressure stripping of hot galactic halos in galaxy clusters*

Authors: *V. Baumgartner, D. Breitschwerdt*

Abstracts: *The intracluster medium (ICM) in galaxy clusters contains heavy elements with about 1/3 of the solar abundance. These heavy elements are the products of stellar nucleosynthesis and are either expelled by galactic winds or lost from the galaxies due to interactions with the intracluster gas. We investigate the stripping of hot, high-metallicity galactic halos, which occurs as galaxies are moving through a cluster, being subject to the ram pressure of the ICM. Our new model for ram pressure stripping differs from earlier models (e.g. Gunn & Gott 1972), since it includes processes inside the galaxies like the transport of gas from the disk into the halo. Taking into account different components of the interstellar medium and their vertical distribution, we get a more realistic and detailed stripping criterion.*

Asmus Boehm

Title: *Testing the hierarchical scenario with field disk galaxy evolution*

Authors: *Asmus Boehm*

Abstract : *We have constructed a data set of >250 field disk galaxies at redshifts $0.1 < z < 1.0$ with Very Large Telescope (VLT) spectroscopy and Hubble Space Telescope imaging. This is one of the largest kinematical samples of distant disks to date. We use spatially resolved rotation curves to derive maximum rotation velocities V_{\max} and total masses; we also investigate disk sizes, bulge-to-disk ratios,*

stellar population properties etc. The stellar-to-total-mass ratios are constant over the probed cosmic epoch, which favors a HIERARCHICAL buildup of the dark matter halos the disks reside in. On the other hand, the mean stellar mass-to-light ratios evolve more strongly in the low-mass galaxies than in high-mass galaxies and the mean stellar ages are lower for low-mass galaxies than for high-mass galaxies. This points to an ANTI-HIERARCHICAL evolution of the stellar populations (aka "downsizing"), possibly due to supernova feedback. We will also present first results from our latest survey of very low- and very high-mass disks at redshift $z \sim 0.5$; these data are among the deepest spectra of distant galaxies ever taken with the VLT. In particular, we aim at a better understanding of the Tully-Fisher Relation and the correlation of V_{\max} with central stellar velocity dispersion.

Samuel Boissier

Title: *The transformation of Virgo galaxies under the influence of ram pressure*

Authors: *Boissier, Boselli*

Abstract: *We show that simple models of chemical/photometric evolution of galaxies allow to study the transformation of galaxies under the influence of ram pressure in the Virgo cluster. With the new data of the large surveys of Virgo in progress (NGVS in the optical, GUViCS in the UV), we will be able to develop such approaches to a larger number of galaxies.*

Paula Brochado

Title: *The assembly of massive galaxies through mergers in the local universe*

Authors: *Brochado P., Brinchmann J., Lobo C.*

Abstract: *Within the LCDM cosmology, mergers of galaxies are a key path in the assembly of new galaxies. To understand the processes behind mergers and their role in the build up of the high mass end of the galaxy mass function, we made use of the spectroscopic catalogue of the Sloan Digital Sky Survey Data Release 6 (SDSS DR6). We present the merger sample of close pairs and groups drawn from SDSS DR6 - selecting galaxies with projected separation of $r_p \leq 30$ kpc and velocity offset of $\Delta v \leq 800$ km/s in the redshift range $0.005 < z < 0.2$ - containing 4000 visually classified potential mergers, including the largest dry merger sample known to date. We show that there is an enhancement of star formation activity of a factor of 2 and investigate the decrease on AGN activity for small galaxy separations. We focus in particular on the role of dry mergers in the build-up of the most massive galaxies showing that massive present-day elliptical galaxies have spectra consistent with the merging of two gas-poor progenitors and that $< 15\%$ of the most massive end of the mass function ($\text{Log}(M/M_\odot) > 11.0$) has been built up by dry mergers since $z=0.2$.*

Fernando Buitrago

Title: *3D spectroscopy unveils minor merging in massive galaxies*

Authors: *Fernando Buitrago*

Abstract : *Massive (stellar mass $\geq 10^{11} M_\odot$) galaxies at high redshift ($z \geq 1.5$) are not very well understood both observationally and in simulations. Their extremely small sizes (effective radii of 1-2*

kpc) make them as dense as globular clusters, whereas in the present day Universe they consist of large galaxies with old and metal-rich stellar populations. In every location they are thought to be the most massive members of their respective environments and thus a key piece to comprehend how galaxies and their surroundings evolve. In order to explore this development, we present near IFU observations with SINFONI at VLT for ten massive galaxies at $z \sim 1.4$ solely selected by their high mass.

3D spectroscopy allow us to retrieve velocity dispersions, kinematic maps and dynamical masses for them. We joined this with data coming from GOODS NICMOS Survey, which was performed by our group and is the biggest sample of massive galaxies (80 objects) at high redshift ($1.7 < z < 3$) to date. As a result, we will show an integral view about the different processes massive galaxies undergo. This includes merging with neighbouring galaxies. Due to the great sensitivity of both sets of images not only major mergers are seen but even the elusive minor events.

Lucio Buson

Title: *NGC 4262: a Virgo galaxy with an extended ultraviolet ring*

Authors: *Bettoni, D., Buson, L, Galletta G.*

Abstract : *GALEX satellite has recently shown the presence of an extended, outer ring studded with UV-bright HII regions surrounding the otherwise normal lenticular galaxy NGC 4262. Such a structure is coupled with a ring of cold (HI) gas. Having structured UV-bright sources beyond its optical disc, NGC 4262 can be classified as a Type I extended ultraviolet disc (XUV).*

Alfredo Carpineti

Title: *The colours, AGN properties, environments and star formation histories of bulge dominated post-mergers in the local universe*

Authors: *Alfredo Carpineti*

Abstract : *Galaxy merging is a fundamental aspect of the standard hierarchical galaxy formation paradigm. In Darg et al.(2010MNRAS.401.1043) we have created a large, homogeneous set of mergers through direct visual inspection of the entire SDSS using the GalaxyZoo project, a public user interface on the world wide web for the morphological classification of galaxies. At the time of writing, over 200,000 volunteers have submitted over 80 million classifications yielding a robust catalogue of around 3000 mergers which has been presented in Darg et al. We explore a subset of galaxies from this catalogue that are 'post-mergers', where the remnant appears to be in the final stages of relaxation. We focus on post-mergers that show evidence for a dominant bulge, making them plausible progenitors of early-type galaxies. For this set of galaxies we explore their GALEX-SDSS UV/optical colours, AGN activity, local environments and star formation histories. 64% of our galaxies are either quiescent or show LINER-like emission, while the rest are either star forming (9%) or have Seyfert AGNs (25%). We find that the plausible mass ratios for the mergers that created these systems are between 1:1 and 1:10, with a median value of around 1:3. The spheroidal postmergers have bluer colours than the general elliptical galaxy population, most likely due to merger-induced star formation. Comparison with stellar models suggests that the star formation activity in most of these systems peaked less than 1 Gyrs ago, suggesting that some of star formation recently discovered in early-type galaxies is merger-driven.*

Kevin Casteels

Title: *Component Pairs Luminosity Functions in the Millennium Galaxy Catalogue*

Authors: *Kevin Casteels and David Patton*

Abstract: *We present new methods for measuring luminosity functions (LFs) of galaxies in close pairs as a probe for luminosity changes in interacting and merging systems. Using mock catalogues we develop techniques for creating global and component (bulges-ellipticals and disks) pairs LFs. We also explore how imposing fixed magnitude ranges (ΔM) between pairs can be used to obtain pairs LFs for majors and minor merger pairs. These techniques are then applied to the publicly available GIM2D bulge/disk decomposition Millennium Galaxy Catalogue (Allen et al. 2006) for pairs in the ranges $r_p < 50$ kpc, $\Delta V < 500$ km/s, and $-17 > M_B > -22$. We find that the global pairs LF has considerably more power towards the bright end compared to the field LF. We also find that all the pairs components have more power towards the bright end of their pairs LFs compared to their field counterparts. The disk and red bulge-elliptical pairs LFs show less luminosity enhancement compared to the global pairs LF, whereas the blue bulge-elliptical pairs LF shows the greatest increase in power towards the bright end. These results indicate that luminosity dependent clustering is definitely taking place, and there is also evidence for significant luminosity enhancement in the blue bulges and ellipticals, possibly due to increased star formation. When a ΔM is introduced between galaxy pairs to isolate major mergers, we find that as ΔM decreases, the pairs LFs gain even more power towards the bright end.*

Ana Chies-Santos

Title: *Ages of globular cluster systems related to galaxy morphology*

Authors: *A. L. Chies-Santos, S. S. Larsen, P. Anders, E. M. Wehner, H. Kuntschner, J. Strader, J. P. Brodie and J. F. C. Santos Jr.*

Abstract : *Some photometric studies of globular cluster (GC) systems using the optical/ near-infrared colour combination have suggested the presence of a great fraction of intermediate-age (2-8 Gyrs) GCs in apparently normal elliptical galaxies with old stellar populations, such as NGC 4365. Using homogeneously derived K-band LIRIS/WHT and archival g and z ACS/HST photometry, we investigate the age distributions of GC systems in 14 E/S0 galaxies. Without relying on SSP models, we perform a relative comparison between the different GC systems quantifying relative age differences. The age distribution of GCs in NGC 4365 appears to be similar to that of other large ellipticals, like NGC 4486 and NGC 4649. We find a correlation between the morphological type of a galaxy and its mean relative GC system age. Galaxies with simple morphology such as E0s, E1s and E2s seem to have on average genuinely old clusters whereas S0s have younger GC systems. Surprisingly, this appears to be driven by the more metal-poor clusters. I will discuss the implications of this finding to the formation/assembly of GC systems and their host galaxies.*

Lodovico Coccato

Title: *Distinct core and halo stellar populations and the formation history of the bright Coma cluster early-type galaxy NGC 4889*

Authors: *L. Coccato (MPE), O. Gerhard (MPE), M. Arnaboldi (ESO)*

Abstract: *We measure the stellar kinematics and the stellar population of the brightest cluster galaxy (BCG) NGC 4889, reaching unprecedented regions at ~ 60 kpc ($4 R_e$) from its center. We construct radial profiles of metallicity, $[\alpha/\text{Fe}]$ abundance ratio and age, from the center out to its halo, probing for the first time the stellar population in the outer halo of a BCG. Our data show that the central ($R < 18$ kpc) and outer ($R > 18$ kpc) parts of NGC 4889 have different stellar population contents and gradients, suggesting different formation histories between the galaxy and its halo. Data for the central parts are indicative of a quasi-monolithic scenario, in which stars formed outside-in, after a single rapid burst. Those for the outer regions indicate that the halo formed later, from shredded satellites that accreted the halo during a series of minor mergers. This is consistent with numerical simulations of formation of BCGs, and the dense environment in which these objects are located. The different chemical properties between the central galaxy and its halo may represent the stellar population signature of the size evolution of NGC 4889, in a scenario in which the halo was accreted on the top of a galaxy of smaller size. This is consistent with the recent findings of the redshift evolution of the sizes of early-type galaxies.*

Bruno Coelho

Title: *AGN feedback and quenching of star formation: a multiwavelength approach with the EURO-VO*

Authors: *Catarina Lobo, Sonia Anton, Bruno Coelho, Isabel Marquez, and Josefa Masegosa*

Abstract : *We selected blueless red sequence galaxies of the SDSS(DR7) using Sersic indices and colours data, compiled on the New-York University Value Added Galaxy Catalogue (NYU-VAGC, Blanton et al. 2005), we obtained about a hundred objects. Using EURO-VO tools we collected multiwavelength data (images and information on fluxes in different wavebands) available for these objects. We built spectral energy distribution of these objects, and undertook a thorough analysis to ascertain: the frequency of AGN among these galaxies, the degree of star formation and intrinsic extinction. We want to determine: how common are blueless galaxies with SMBHs and how red and dead are they?*

Arianna Cortesi

Title: *Unravelling the origins of S0 galaxies using maximum likelihood analysis of planetary nebulae kinematics*

Authors: *Arianna Cortesi for the PNS consortium*

Abstract : *To better understand the origins of S0 galaxies, we present a new method of analyzing their stellar kinematics from discrete tracers such as planetary nebulae. This method involves binning the data in the radial direction so as to extract the most general possible non-parametric kinematic*

profiles, but using a maximum likelihood fit within each bin in order to make full use of the information in the discrete kinematic tracers. Both disk and spheroid kinematic components are fitted, with a two-dimensional decomposition of imaging data used to attribute to each tracer a probability of membership in the separate components. Likelihood clipping also allows us to identify objects whose properties are not consistent with the adopted model, rendering the technique robust against contaminants and able to identify additional kinematic features. As a first test of the method, we apply it to the S0 system NGC 1023, for which a PN catalogue has already been released and analyzed by Noordermeer et al. (2008). This new analysis demonstrates that the peculiar kinematic properties previously attributed to this galaxy can be fully explained by contamination from spheroid stars. Its stellar kinematics are, in fact, indistinguishable from those of a normal spiral galaxy, indicating that it may have evolved directly from such a system via gas stripping. The method also has sufficient sensitivity to identify a relatively small population of stars that do not fit with the kinematics of the main galaxy, but appear to be a star stream associated with an ongoing minor merger. We are currently applying this analysis technique to observations of a larger sample of S0 galaxies whose PNe kinematics have been observed with PN.S; by obtaining a measure of the stellar kinematics of S0s in a range of field, poor and rich group and environments, we will be able to see if they all have the stripped-spiral properties of NGC 1023, and hence whether there is a single route to S0 formation.

Olga Cucciati

Title: *The VIMOS VLT Deep Survey: a homogeneous galaxy group catalogue up to $z \sim 1$*

Authors: *Cucciati, Marinoni, Iovino, Bardelli, Adami, and the VVDS Team*

Abstract: *We present a homogeneous and complete catalogue of optical galaxy groups identified in the VIMOS-VLT Deep Survey (VVDS). We use mock catalogues extracted from the Millennium simulation to study the potential systematics that might affect the overall $n(z)$ distribution of the identified systems, and also to assess how well galaxy redshifts trace the line-of-sight velocity dispersion of the underlying mass overdensity. We train on these mock catalogues the adopted group-finding technique (the Voronoi-Delaunay Method, VDM), to recover in a robust and unbiased way the redshift and velocity dispersion distributions of groups and maximize the level of completeness and purity of the group catalogue. We identify 144 VVDS groups with at least 3 members within $0.2 \leq z \leq 1.0$. We use the group sample to study the redshift evolution of the fraction of blue galaxies ($U-B < 1$) within $0.2 \leq z \leq 1$ in both groups and in the whole ensemble of galaxies irrespectively of their environment.*

Payel Das

Title: *An X-ray view on massive elliptical galaxies: Their dark matter content*

Authors: *Payel Das, Ortwin Gerhard, Eugene Churazov, Irina Zhuravleva*

Abstract: *Massive elliptical galaxies are huge conglomerates of stars, dust, dark matter and hot gas that emits lines and thermal bremsstrahlung radiation. In quiescent galaxies the hot gas is in hydrostatic equilibrium and therefore serves as a powerful probe of the gravitational potential. We have developed a new non-parametric Bayesian approach to obtain the most probable mass distributions and associated confidence ranges, given density and temperature profiles of hot gas in hydrostatic equilibrium. We applied this to Chandra and XMM-Newton observations of a sample of six nearby massive elliptical galaxies, occurring at the centre of dense environments in groups and the*

Virgo and Fornax clusters of galaxies. We find that at large radii, the mass profiles rise more steeply than isothermal profiles, supporting that the galaxies in the sample are embedded in the more massive group-sized haloes of the surrounding environments. Complementing the total mass information from the X-rays with photometry and stellar population models to infer the dark matter content, we find massive dark matter haloes with dark matter mass fractions of ~35-80% at $2R_e$, rising to a maximum of 80-90% at the outermost radii. We also find that the six galaxies follow a Tully-Fisher relation with slope ~ 4 showing that systems with more luminous stellar components reside in the deepest potentials. Finally, we find that more massive systems are found in denser environments, supporting that a larger number of systems fall onto the central system compared to in less dense regions.

Boris Deshev

Title: *A volume limited HI imaging survey at $z=0.2$*

Authors: *B. Deshev, M. Verheijen, J. van Gorkom, K. Dwarakanat, B. Poggianti*

Abstract: *We present here results from our completed ultra-deep blind HI survey of two galaxy clusters at redshift $z=0.2$, performed with the Westerbork Synthesis Radio Telescope (WSRT). The field of the X-ray bright, massive Butcher-Oemler cluster Abell 963 was observed with a total of 117×12 hrs integration time. Additionally, Abell 2192 was observed as an example of a more diffuse cluster, at similar distance, with a total of 73×12 hrs integration time. In both fields, sampling a total volume of $7 \times 10^4 \text{ Mpc}^3$, the expected noise levels of 19 and $24 \times 10^{-6} \text{ Jy/beam}$ respectively, at a velocity resolution of 44 km/s, were achieved. This allows for a clear, 21cm. view on the large scale structure in which the clusters are embedded, ranging from voids through filaments and groups infalling in the clusters to the centers of the clusters themselves. Additionally the entire primary beam of WSRT is imaged in B and R optical bands with INT (Isaac Newton Telescope). The ~ 170 detections with optical counterparts found in the two fields clearly outline the clusters and few groups, out to 5 Mpc away from the cluster centers. No galaxy with HI mass above our detection limit of $10^9 M_\odot$ is found in the central 1Mpc of both clusters. The non-detection of the blue galaxies in the center of A963, responsible for the Butcher-Oemler effect, suggests that although still blue, those galaxies must have already lost most of their gas, probably due to interaction with the cluster environment. The space, velocity and mass distribution of the HI detections is presented here, with the complementary optical colors and morphology. This data base, combined with our deep optical imaging, UV GALEX data and IR Spitzer imaging will uniquely link gas content and star formation for galaxies in a wide range of environments, and shed a light on the gas content of the blue cluster population at intermediate redshift.*

Igor Drozdovsky

Title: *Local Galaxy Evolution as a Function of Mass and Environment*

Authors: *Igor Drozdovsky*

Abstract : *Based on the updated all-sky catalog of ~ 8600 Local Supercluster galaxies within 30 Mpc, we are presenting a new comparative study of the galaxy content and the mean characteristics of the nearby Universe (true "redshift-zero") as a function of mass and environment. Our main goal is to shed light on the process of galaxy formation and evolution for two extreme low-/high-density environments: the isolated versus closely interacting galaxies. This would allow us to disentangle the effects of internal physical processes on the star formation history (SFH) from environment-related*

mechanisms. The formation and evolution of low-mass galaxies is of particular interest in this respect, since these simplest stellar systems are ubiquitous and less affected by an unknown galaxy assembly history. I would present results from two complementary studies: (i) the recent star formation and mean baryonic properties of the local Universe as a function of environment; (ii) the star formation and chemical enrichment histories of the nearby satellite versus isolated galaxies from their resolved stars (the LCID project). While the first project is focused on the current morphology-density properties of the Local Supercluster, the second "fossil records" study is able to probe entire SFH of the nearby galaxies, including the early-epoch (look-back time > 8 Gyr). Given the many recent advances in our understanding of the star formation history (SFH) of the Local Group (LG) and other nearby galaxies, and in the evolution of star formation with redshift, we also present an updated comparison of the comoving space density of the star formation rate as a function of look-back time for the Local and Distant Universe. While the recent episodic star formation activity is observed in dwarf galaxies, most dwarfs of the Local Group and its surroundings are also dominated by the old stellar populations with no apparent evidence for the 'downsizing' effect in the galaxy evolution. The overall trend of star formation density from the LG supports a fairly flat evolution of the SFR without showing the turnover implied by the Lyman dropout measurements. This suggests factors of ~10 extinction correction to high-redshift UV-based measures.

Igor Drozdovsky

Title: *Comparing the Redshift Evolution of Emission Line Galaxies behind the Virgo Cluster field*

Authors: *Igor Drozdovsky, J.M. Rodriguez Espinosa, C. Muñoz Tuñon, J.A. Lopez Aguerri, M. Arnaboldi, J.M. Mas-Hesse, O. Gerhard, R. Schulte-Ladbeck, N. Castro-Rodriguez*

Abstract : *We present the first results from our survey of high-redshift galaxies behind the Virgo Cluster field. Two main objectives of this program are (i) to study the properties and contribution of the Ly α emission line galaxies (LAE) to the Star Formation Rate Density (SFRD) of the Universe at $z > 3$; (ii) to explore the decline of Cosmic SFRD at $z < 1$ and the downsizing effect. Based on the analysis of deep images obtained in 500nm, H α & 720nm narrow-band and various broad-band filters, we have identified a sample of ~120 candidate LAE and a few hundreds low-redshift emission line galaxies, reaching emission lines to a flux limit of $> 2 \times 10^{-18}$ ergs/sec/cm 2 . Follow-up observations with the VLT/VIMOS and GTC/OSIRIS of one of the survey fields have confirmed our classification and redshifts. We measure star formation rates from the observed Ly-alpha, [OII], [OIII], or H α line fluxes. In addition to the large area of this survey (~3 deg 2 in total) and depth, a possibility to carry out both, the low-redshift (the outer Virgo intracluster objects) and high-redshift studies within the same field makes our survey unique. When our survey will be completed, by comparing the Luminosity Functions of $z > 3$ LAEs we will be able to shed light on the redshift evolution of these important tracers of star formation in the early Universe, testing alleged change in their properties between $4 < z < 5$, and estimate their contribution to the Cosmic SFRD.*

Ivana Ebrova

Title: *New Approaches to Simulating Shell Galaxies Formation in Minor Mergers*

Authors: *Ivana Ebrova, Bruno Jungwiert, Lucie Jilkova, Miroslav Krizek, Katerina Bartoskova*

Abstract : *The mechanism of the formation of faint stellar shells around elliptical galaxies in a radial minor merger is known since 80s. We simulate this process using time dependent analytical potentials that represent the merging galaxies together with millions of test particles. We developed a method which allows us to compute the dynamical friction acting on the dwarf galaxy during such merger. The method is based on the Chandrasekhar formula, but it takes into account the changes of density and velocity dispersion over the giant elliptical galaxy. In order to do this, we used the axial symmetry of our configuration to simplify the integrals over the impact parameter and velocity distributions so that they can be solved numerically. The combination of the friction and gradual disruption of the dwarf galaxy has never been modeled in much detail, and it has a dramatic impact on the positions and luminosities of the shells. These phenomena need to be considered in the context of probing the history of the merger in a shell galaxy. Furthermore we investigate the effect of the dark matter content on the resulting appearance of the structure taking into account the present state of knowledge of stellar and dark matter distributions in both giant and dwarf ellipticals.*

Ivana Ebrova

Title: *Quadruple-peaked Line-of-sight Velocity Distributions in Shell Galaxies*

Authors: *Ivana Ebrova, Lucie Jilkova, Bruno Jungwiert, Katerina Bartoskova, Miroslav Krizek, Tereza Bartakova, Ivana Stoklasova*

Abstract : *As shown by Merrifield & Kuijken (1998) stellar absorption line profiles in shell galaxies can in principle be used to constrain the distribution of dark matter halos. We show, however, that line shapes are more complex than previously thought, a quadruple-peaked line profiles being more natural than the originally proposed double peaked-ones. We present the theoretical analysis of the line profile as well as several sets of numerical simulations of minor mergers and show how to derive halo properties from the positions of all the four velocity peaks.*

Paul Eigenthaler

Title: *An optical Study of Fossil Galaxy Groups*

Authors: *Paul Eigenthaler, Werner W. Zeilinger*

Abstract: *Numerical simulations as well as optical and X-ray observations have shown that poor groups of galaxies can evolve to what is called a fossil group. Dynamical friction as the driving process leads to the coalescence of individual galaxies in ordinary poor groups leaving behind nothing more than a central, massive elliptical galaxy supposed to contain the merger history of the whole group. Due to merging timescales for less-massive galaxies and gas cooling timescales of the X-ray intragroup medium exceeding a Hubble time, a surrounding faint-galaxy population and an extended X-ray halo similar to that found in ordinary groups, is expected. However, detailed studies of fossil groups in the optical have only been carried out for a handful of systems.*

Using both VLT VIMOS and WHT ISIS data we investigate the luminosity function of one fossil aggregate and the stellar population of six fossil group central ellipticals.

Carmen Eliche-Moral

Title: *Reconciling a significant hierarchical assembly of massive early-type galaxies at $z \sim 1$ with mass-downsizing*

Authors: *M.C. Eliche.-Moral, M. Prieto, J. Gallego, J. Zamorano*

Abstract : *Recent studies derive opposite conclusions on the role of major mergers in the buildup of the present-day massive early-type galaxies (mETGs). In fact, hierarchical models predict that they must have finished their assembly at a quite late cosmic epoch ($z \sim 0.5$), conflicting with the observational phenomenon of galaxy mass-downsizing. In this talk, we present the results of a semi-analytical model that tries to test this question directly, by studying how the present-day mETGs population would have evolved backwards-in-time, under the hypothesis that each observed major merger has given place to an early-type galaxy. We will show that the model can reproduce the observed evolution of the galaxy LFs at $z < 1$, simultaneously for different rest-frame bands and selection criteria. Accordingly to observations, the model shows that: 1) the increase of the mETGs number density and of the stellar mass at the massive-end of the red sequence observed since $z \sim 1$ to the present can be explained just accounting for the effects of the major mergers strictly-reported by observations; 2) the wet major mergers must have controlled this buildup since $z \sim 1$, although dry and mixed mergers have also contributed significantly to it; 3) the bulk of this assembly takes place during the time-period of ~ 1.4 Gyr elapsed at $0.7 < z < 1$, being nearly frozen at $z < \sim 0.7$; and 4) this frostbite can be explained just accounting for the observational decrease of the major merger fraction since $z \sim 0.7$. The most striking model prediction is that at least $\sim 87\%$ of the mETGs existing at $z \sim 1$ are not the passively-evolved, high- z counterparts of present-day mETGs, but their gas-poor progenitors instead. This implies that $< \sim 5\%$ of present-day mETGs have been really in place since $z \sim 1$. We will show that, accounting for this fact, the model is capable of deriving a final assembly redshift of mETGs in good agreement with hierarchical models, reproducing observational mass-downsizing trends at the same time.*

Anna Ferre-Mateu

Title: *Early-type galaxies in clusters at different redshifts to constrain their evolution*

Authors: *Anna Ferre-Mateu, P. Sanchez-Blazquez, A. Vazdekis, I.G de la Rosa*

Abstract: *I will present a new detailed stellar population analysis of early-type galaxies in one dense cluster at $z=0.83$ and two at $z \sim 0.55$. Unlike in previous studies at intermediate redshifts we aim at studying galaxies on an individual basis and fully characterize their stellar populations as a function of galaxy mass and cluster properties with increasing redshift. For this, we are using very high S/N data obtained with GEMINI. The analysis of stellar population in high redshift early-type galaxies is, somehow, easier at higher redshift as the spectral properties vary much faster with age as for younger ages. Based on medium-quality SDSS spectra, our group has recently found that there exist clear correlations between key abundance ratio chemical clocks and cluster properties at $z \sim 0.1-0.2$, suggesting differences in galaxy cluster assembly timescales. For all three clusters, galaxies have been morphologically classified so we can focus in those that are confirmed early-types. We determine mean*

luminosity-weighted ages and a number of abundance ratios of species and their relation with the cluster properties.

Marco Grossi

Title: *Stellar populations and HI complexes in the halo of M33*

Authors: *M. Grossi, N. Wang, E. Corbelli, C. Giovanardi, S. Okamoto, N. Arimoto*

Abstract : *The late-type spiral galaxy M33 is the brightest of M31's satellites. While M31 is known to be a disturbed galaxy, M33 seems not to have undergone any recent or past mergers having a quite undisturbed stellar disc and no prominent bulge. On the other hand, the presence of a population of neutral hydrogen (HI) clouds, recently found in the outskirts of the galaxy with a blind 21-cm survey (ALFALFA), may give evidence for ongoing minor mergers, the recent arrival of external gas, or a past interaction with M31. We present Subaru/Suprime-Cam deep V and I observations of seven fields in the outer disc and halo of M33 in correspondence of the main HI features around this galaxy. We analyse the stellar population by means of I, V-I colour magnitude diagrams reaching down to the red clump. We find an extended distribution of red giant branch stars out to a deprojected radius of 30 kpc in the southeast and 40 kpc in the northwest direction from the center. Young stellar populations with age of around 100 Myr are found out to 20 kpc (~10 visual scale lengths), between the main HI complex in the southeast and the galactic disc. We present preliminary results on the star formation history of these regions using the technique of synthetic CMD fitting, and we discuss whether the HI and stellar distributions could be related to a past interaction with M31.*

Ruth Grutzbauch

Title: *Nature and nurture in the evolution of faint galaxies: the relationship between stellar population parameters, velocity dispersion, morphology and environment*

Authors: *R. Grutzbauch, F. Annibali, A. Bressan, R. Rampazzo, W. W. Zeilinger*

Abstract: *We present a stellar population analysis for a sample of 11 faint early-type galaxies located in poor groups, i.e. low-density environments. The mean ages, metallicities, and $[\alpha/\text{Fe}]$ ratios were derived from the Lick indices through comparison with simple stellar populations (SSPs) accounting for variable $[\alpha/\text{Fe}]$ ratios. Our galaxies turn out younger, less metal rich, and less enhanced in the α -elements than giant ETGs, in agreement with the extrapolation of the stellar population parameters vs velocity dispersion trends seen in giant ETGs. We also observe a strong positive correlation between $[\alpha/\text{Fe}]$ and the bulge-to-total light ratio, and between $[\alpha/\text{Fe}]$ and the Sersic index n : less concentrated, more disk galaxies exhibit lower $[\alpha/\text{Fe}]$ ratio, which can be interpreted with longer star formation time-scales or steeper initial mass function. Comparing our sample with Coma dwarfs, we find that environment strongly affects the evolution of faint galaxies: the $[\alpha/\text{Fe}]$ ratios increase from low to high densities. By contrast, no strong difference in the $[\alpha/\text{Fe}]$ ratios is observed for giant ETGs in the field and in the cluster. This could be explained with that massive ETGs completed their star formation process at early times, before the emergence of structures, and do not exhibit today a strong environmental dependence. On the other hand, low mass galaxies, which evolved much slower (according to downsizing) and could eventually feel the effect of environment, bring today the clear sign of "nurture". This scenario is in agreement with findings based on large redshift surveys, which revealed an increasing environmental effect on galaxy evolution moving from higher to lower redshift,*

and from higher to lower galaxy stellar masses.

Jennifer Gupta

Title: *Compact Radio Cores: blazars and more*

Authors: *Jennifer Gupta*

Abstract : *Radio-loud active galactic nuclei are now recognised to play a vital role in the process of galaxy formation, providing feedback which regulates the star-formation process. Logically, it follows that we must understand AGN in order to understand galaxy formation and evolution. However, the details of AGN feedback are unclear, it is still not known what triggers the bursts of AGN activity, how long the bursts of activity last or how the bursts evolve. Blazars are a subset of radio-loud AGN where one of the radio jets is directed towards the observer at a small angle to the line of sight. Therefore in blazars we get the most direct view of the relativistic jets that may ultimately provide the feedback. Blazar samples in the past have been plagued with selection effects which make it impossible to differentiate between intrinsic properties and selection-induced trends. We have defined a new sample of nearby blazar-like objects, minimising the selection effects in order to understand the fundamental properties of these objects. The Survey of Extragalactic Nuclear Spectral Energies (SENSE) sample contains 151 compact radio core objects within $z < 0.2$. Here we present the first results from the SENSE sample with an emphasis on the ways in which we are using multiwavelength observations of this carefully selection sample to probe the physics of blazars and the wider AGN population.*

Bruno Henriques

Title: *The effect of TP-AGB stars on the evolution of the rest-frame near-infrared galaxy luminosity function*

Authors: *Bruno Henriques, Claudia Maraston, Pierluigi Monaco, Fabio Fontanot, Nicola Menci, Gabriella De Lucia, Chiara Tonini*

Abstract : *We address the fundamental question of matching the rest-frame K-band luminosity function of galaxies over the Hubble time using semi-analytic models, after modification of the stellar population modelling. We include the Maraston (2005) evolutionary synthesis models, that feature a higher contribution by the Thermally Pulsating - Asymptotic Giant Branch (TP-AGB) stellar phase, into three different semi-analytic models, namely the De Lucia and Blaizot version of the Munich code, MORGANA and the Menci model. We find that the modification of the stellar population emission alone solves the mismatch between models and the observed rest-frame K-band luminosity from the brightest galaxies derived from UKIDSS data at high redshift. For all explored semi-analytic models this holds at the redshifts - between 2 and 3 - where the discrepancy was recently pointed out. The reason for the success is that at these cosmic epochs the model galaxies have the right age to contain a well-developed TP-AGB phase which makes them redder without the need of changing their mass or age. At lower redshifts ($z < 2$) some of the explored models deviate from the data, which is associated to too short merging timescales and inefficient radio-mode AGN feedback.*

Marc Huertas-Company

Title: *HAWK-I cluster survey*

Authors: *Huertas-Company, Marc ; Lidman, Chris and the HCS collaboration*

Abstract: *Distant galaxy cluster surveys are a unique probe of the effects of environment in galaxy evolution. Given their distance, observations at near-IR are needed to sample the rest frame optical. However, current studies have been limited by the lack of high-quality and uniform data in the near-IR. We have obtained a uniform set of deep near-IR images with the HAWK-I camera on the VLT of 10 massive galaxy clusters currently in the redshift $0.8 < z < 1.4$. All the clusters in the survey also have deep ACS images and extensive multi-object spectroscopy. The poster will summarize the status of the survey and present some first results.*

Yara Jaffe

Title: *The effect of the environment on the Tully-Fisher relation*

Authors: *Yara Jaffe, Alfonso Aragon-Salamanca, Harald Kuntschner and Steven Bamford*

Abstract: *We measure the relation between galaxy luminosity and disk maximum rotation velocity (the Tully-Fisher relation [TFR]) for a sample of 418 emission-line galaxies from the ESO Distant Cluster Survey. Our aim is to distinguish between the possible physical mechanisms that act on galaxies when they fall into clusters and provide observational constraints for theoretical models of galaxy formation. The sample spans a vast range of environments up to $z < 1$. We compare the TFR residuals of field and cluster galaxies for 'matched' samples in absolute B-band magnitude and redshift. Interestingly, we find the TFR residual distribution of both populations to behave similarly. This finding favors a scenario in which galaxies do not experience an initial enhancement of their star formation when they join a galaxy cluster, as it has been proposed in previous studies with smaller samples. Moreover, we looked at the morphologies of the galaxies in our sample and found a population of elliptical galaxies that show a clear rotation curve. These could be the progenitors of the similar objects found locally.*

Noelia Jimenez

Title: *The Bright End of the Colour-Magnitude Relation*

Authors: *Noelia Jimenez, Sofia Cora*

Abstract: *We investigate the origin of the colour-magnitude relation (CMR) followed by early-type cluster galaxies by using a combination of cosmological N -body simulations of cluster of galaxies and a semi-analytic model of galaxy formation (Lagos, Cora & Padilla 2008). Results show good agreement between the general trend of the simulated and observed CMR. However, in many clusters, the most luminous galaxies depart from the linear fit to observed data displaying almost constant colours. With the aim of understanding this behaviour, we analyze the dependence with redshift of the stellar mass contributed to each galaxy by different processes, i.e., quiescent star formation, and starburst during major/minor and wet/dry mergers, and disk instability events. The evolution of the metallicity of the stellar component, contributed by each of these processes, is also investigated. We find that the major contribution of stellar mass at low redshift is due to minor dry and*

major dry mergers, being the metallicity of the stellar mass accreted during this process quite low. Thus, these events seem to increase the mass of the more luminous galaxies without changing their colours.

Jonas Johansson

Title: *The chemical enrichment histories of SDSS galaxies*

Authors: *Jonas Johansson, Daniel Thomas, Claudia Maraston*

Abstract : *We derive the full chemical enrichment histories for SDSS galaxies using a large variety of abundance ratios, namely [C/Fe], [N/Fe], [O/Fe], [Mg/Fe], [Ca/Fe] and [Ti/Fe]. The sample consists of nearly 4000 quiescent early-type galaxies. We utilise stellar population models of absorption line indices that are an updated and flux-calibrated version of the models of Thomas et al. (2003) based on the MILES stellar library. Most importantly, the flux calibration of our new models makes the application of Lick offsets unnecessary. We confirm previous results of increasing age, [Z/H] and [α /Fe] with stellar velocity dispersion and galaxy mass. We derive similar trends for the elements [O/Fe], [Mg/Fe], [C/Fe] and [N/Fe]. On the contrary we find that Ca and Ti scale with Fe, hence there are no such correlations with galaxy mass for either [Ca/Fe] or [Ti/Fe]. This indicates that SNIa contribute more to the enrichment of heavy alpha-elements than previously thought. This puts strong constraints on supernova nucleosynthesis and models of galactic chemical evolution. Interestingly, we find no correlations with environment for any of the element abundance ratios. This is in disagreement with previous studies that found indications for over-abundances of N and C in low density environments and poses tight constraints to the formation histories of massive elliptical galaxies.*

Eva Juette

Title: *Lopsidedness in WHISP galaxies*

Authors: *Eva Juette, Janine van Eymeren, Chanda Jog, Ralf-Juergen Dettmar, Yelena Stein*

Abstract : *It has been known for many years that galaxy discs are often asymmetric, both in the stellar and the gaseous component. However, the origin of this effect is not well known to date, and quantitative studies are rare. Here we present the first statistical investigation of a large sample of HI discs using the WHISP survey. We obtained a Fourier-Analysis to study the morphological lopsidedness in 76 galaxies. This allows to trace the degree of asymmetry with radius. We further investigated dependence on e.g., the galactic type and the environment.*

Sugata Kaviraj

Title: *The evolution of early-type galaxies over the last 8 billion year: insights from the rest-frame UV*

Authors: *Sugata Kaviraj, Sukyoung Yi, Kevin Schawinski, Richard Ellis, Eric Gawiser, Pieter van Dokkum, Joseph Silk and the GALEX and MUSYC collaborations*

Abstract : *An exciting recent discovery has been the detection of widespread recent star formation (RSF) in nearby early-type galaxies (ETGs), using new survey data in the rest-frame UV. We review the*

current status of this work, with a particular emphasis on the drivers of this star formation. Data from the GALEX UV survey ($z < 0.1$), combined with deep optical surveys (e.g. MUSYC, GOODS, COSMOS) that trace the rest-frame UV at high redshift, indicate that ETGs of all luminosities form stars over the lifetime of the Universe, with luminous systems ($-23 < M_V < -21$) forming up to 10-15% of their stellar mass after $z = 1$. While small mass fractions of young stars seem to be ubiquitous in the nearby ETG population, the source of this star formation remains a matter of debate. We demonstrate that the RSF at late epochs cannot be driven solely by internal mass loss, suggesting that some or most of the gas fuelling the RSF is externally accreted. Visual inspection of HST images of ETGs from the COSMOS survey at $z \sim 0.5$ show a remarkable correspondence between the presence of morphological disturbances and UV excess, which suggests that mergers may be the principal driver of this RSF. However, the major merger rate is found to be too low to satisfy the number of ETGs that carry such morphological disturbances, suggesting minor mergers as the primary channel of gas accretion and star formation in the ETG population. We discuss the implications of repeated minor merger activity on the spectral and dynamical evolution of massive galaxies and draw comparisons with the literature which suggest that minor merging, a hitherto poorly explored process, may be a key element of the evolution of galaxies at late epochs.

Alexei Kniazev

Title: *Metallicities of galaxies in the nearby Lynx-Cancer void*

Authors: *Kniazev A.Y., Tepliakova A., Pustilnik S.A., Burenkov A.N.*

Abstract: *We present the first results of spectral observations of dwarf galaxies in the Lynx-Cancer void. For more than one third of about 100 galaxies the estimates of the O/H parameter are obtained. The data are mainly from spectral observations with the SAO 6m telescope, and also from SDSS and the literature. The analysis of the obtained data indicates a systematically lower metal content in the galaxies of this void compared with field dwarf galaxies. Additionally, we present more detailed information and discuss the properties of several galaxies with metallicities near the bottom of the known range, namely with $12 + \log(O/H) = 7.12 - 7.3$.*

Maurice Laloum

Title: *DYNAMICS OF THE GALAXY : STRUCTURE, FLARES AND COSMIC RAYS*

Authors: *Maurice Laloum*

Abstract : *Many essential paradoxes in the mechanical balance of the Galaxy are highlighted. Their outstanding relevance demands a coherent and likely explanation. We propose a unique and synthetic interpretation , including a cosmological theory of the origin of the observed cosmic rays, especially at the highest energies known. It involves MATTER-ANTIMATTER ANNIHILATION in the median plane of the Milky Way, as a source of "DARK MATTER". Accordingly, we discuss the structure and balance of the Galaxy, seen as made of two parallel disks of matter versus antimatter dominance, and opposed by the repulsion of an annihilation gas, settled in the equator disk. The admitted suppression of antimatter in the Universe, just after the "Big-Bang", is questioned. Accordingly, ULTRA-RELATIVISTIC THERMODYNAMICS of cosmic rays are settled. The rhythmic emissions of "Gamma-Ray Bursts" and other flares are easily explained. Many stringent tests tend to confirm this theory : pointedly, the now classical energy behaviour of the incident flux of energetic*

cosmic rays is easily derived as a power law, quite with expected exponents of -2.5 and -3, possibly (main dependence, including the first knee). Ultra-high energies, further, are easily attainable, with no necessary restriction of the "GZK" kind, for instance. Beyond 10^{20} eV, rather, a new break is still thus made feasible. Beyond CP invariance, T reversal is axiomatically discussed, as well as the very nature of time in Special Relativity.

Carlos Lopez-Sanjuan

Title: *VVDS-Deep survey: from major to minor mergers of bright galaxies up to $z = 1$*

Authors: *Lopez-Sanjuan, C., Le Fevre, O., de Ravel, L., Cucciati, O., & VVDS Team*

Abstract: *We present the first determination of the minor merger rate from spectroscopically confirmed close pairs. We take advantage of the wide area (0.5 deg^2) and deep spectroscopy ($I_{AB} < 24$) of VVDS-Deep survey to study the major to minor merger fraction of bright galaxies ($L_B > L_{B^*}$) in the range $0.2 < z < 0.95$. We find that the minor merger rate (luminosity ratio $1/4 < \mu < 1/10$) increases with cosmic time, becoming higher than the major merger rate ($\mu > 1/4$) at $z = 0.5$. On the other hand, the major + minor merger rate ($\mu > 1/10$) is roughly constant, in agreement with previous morphological studies. When we split our bright galaxies into red and blue by their rest-frame NUV-R color, we find that the merger fraction of red galaxies is higher than the one of blue galaxies, and that it does not evolve in the redshift range under study. Our measured merger rate implies ~ 1 merger (0.6 major, 0.4 minor) event per red galaxy since $z = 1$, with a stellar mass increase of 35% and a size evolution by a factor of 1.8. These values are consistent with the evolution of massive red sequence galaxies, and suggest mergers as drivers of these systems' evolution since $z = 1$. On the other hand, the major merger fraction of blue galaxies decreases dramatically with cosmic time, being minor companions three times more numerous than major at $z = 0.5$. However, minor mergers are not enough to drive a spiral to elliptical transformation, but likely a late to early spiral one.*

Lucia Marchetti

Title: *A multi-wavelength view on Galaxy Formation & Evolution : the SWIRE-SDSS database & the Spitzer/Herschel Local Luminosity Function*

Authors: *Lucia Marchetti, Mattia Vaccari, Alberto Franceschini, SWIRE & HerMES*

Abstract : *Infrared wavelengths contain a substantial amount of information about the origin of galaxies and active galactic nuclei and about the evolutionary history of star formation, metal production and gravitational accretion. They present a widely complementary view with respect to more classical galaxy surveys in the optical. In a context of ever deeper surveys at most wavelengths, it is even more difficult and important to reliably measure galaxy infrared properties in the Local Universe: difficult because the very possibility to carry out extremely deep observations leads to most observing time being spent on the deepest pencil-beam surveys rather than shallower wider-area ones, and important because the increasingly detailed knowledge of the high-redshift Universe needs similarly well-defined local benchmarks to trace the formation and evolution of galaxies across cosmic time in great detail. Perhaps more importantly, in the era of multi-wavelength surveys and virtual observatories, shallow wide-area surveys with large data rates are likely to profit the most from the paradigm shift caused in astronomical research by the easy access to a number of otherwise separate databases for science exploitation. Our work capitalizes on the above trends. We present a detailed*

investigation of statistical properties of infrared galaxies in the low-redshift universe by exploiting two major survey projects, in the infrared and optical respectively. The SWIRE (infrared) and the SDSS (optical) catalogs are matched with early HerMES/Herschel data as well as with ancillary datasets such as the INTWFS, 2MASS and UKIDSS, to derive the galaxy local luminosity function at MIPS (24, 70 and 160 μm) and SPIRE (250, 350 and 500 μm) bands and thus place stronger constraints on models for the formation and evolution of infrared galaxies. A good knowledge of statistical properties of galaxies across such a wide wavelength range and a 50 deg^2 area puts us in the best position to study the different processes playing a role in galaxy formation and evolution and thus determine how the environment shapes galaxy properties across cosmic history.

Esther Marmol Queralto

Title: *CALIFA Survey: mapping the local universe in 3D*

Authors: *Esther Marmol-Queralto & CALIFA COLLABORATION*

Abstract : *The Calar Alto Legacy Integral Field Area Survey (CALIFA Survey, PI: S.F. Sanchez) is an international project which main objective is to characterize the gas and stellar content in galaxies at the Local Universe by studying their spatially resolved spectroscopic properties in the optical range. For doing so, CALIFA will observe a diameter selected, statistically well defined, sample of ~ 600 galaxies up to $z \sim 0.03$ (ie., ~ 120 Mpc), of any kind, covering the full color-magnitude diagram down to $M_b \sim -18$ mag. The observations will be performed using the wide-field IFU PPAK integrated in the PMAS spectrograph at the 3.5m telescope of the Calar Alto Observatory, using two different configurations, mostly focused in the study of the gas content and stellar population of these galaxies, in one hand, and in the dynamical properties, on the other. In order to achieve this huge program, the Calar Alto Executive Committee has allocated 210 dark nights in the next 6 semesters (starting in July 2010) to perform the required observations. This international project comprises more than 50 astronomers, of 5 different countries and 8 different institutes across the world (mainly European centers). We present here this ongoing project that will provide the largest and most comprehensive wide-field IFU survey of galaxies carried out to date and will allow to address several fundamental issues in galactic structure and evolution.*

Hugo Messias

Title: *Pure DRGs: witnessing a link between Starburst and AGN activities at redshifts 2-4?*

Authors: *Hugo Messias, José Afonso, Andrew Hopkins, Bahram Mobasher, Jennifer Lotz, Duncan Farrah*

Abstract : *Extremely and Distant Red Galaxies are known to reside in denser environments when compared with the overall K-selected galaxy population. Among the most massive objects in the early universe, they are thought to be the progenitors of local massive ellipticals. In this talk I will focus on a sub-population of Distant Red Galaxies that appears to be forming through merger accretion. They are mostly found in the range $z \sim 2-4$, coincident with the peak of activity in the universe, and simultaneously show star-formation and AGN activity. This population may provide important clues for the connection between these two phases through a merger scenario, as already proposed by galaxy evolution models and other observational work.*

Areg Mickaelian

Title: *Study of the Byurakan-IRAS Galaxy pairs and the galaxy evolution*

Authors: *Mickaelian, A.M.*

Abstract : *Byurakan-IRAS Galaxies (BIG) are the extragalactic objects resulted from the project of optical identifications of IRAS point sources based on their DSS images and the DFBS (Digitized First Byurakan Survey) low-dispersion spectra. As a result, 1278 galaxies have been revealed at high galactic latitudes, including 42 PSC sources identified with 103 galaxies that make up 30 physical pairs and 12 multiples (interacting systems and mergers). These BIG objects have been observed spectroscopically; the redshifts have been measured and classification for activity types has been carried out (Seyferts, LINERs, SB, HII). Using more accurate FIRST positions, we have defined the real IR sources; they might be either one of the components or all components are responsible for the IR radiation. It is shown that for the cases where more than one component is an IR source, the average IR luminosity is higher; typically IR luminosity $> 10^{12} L_{\odot}$ is coming from the whole system, which means that the interactions induce vast amounts of dust and/or trigger intense starburst processes in these objects. The dependence of the mean distances of components on the IR luminosity and redshift has been studied to follow the evolution of these interacting/merging systems. Some of the systems contain AGN that allows us investigate the interrelationship between starburst and nuclear activity, as well as interactions.*

Nigel Mitchell

Title: *Towards Understanding Simulations of Galaxy Formation*

Authors: *Nigel Mitchell*

Abstract : *Numerical simulations are now a fundamental tool with which modern astronomers test current theory. However an increasing number of authors have noted significant discrepancies between galaxy properties when run in different hydrodynamic codes (e.g. Frenk 1999, Agertz 2007, Mitchell 2009). As we can now finally begin to run large cosmological simulations with complex gas physics it is necessary to understand the way in which these differences between codes affect the properties of the ISM. From the efficiency of supernova feedback to the large scale heating of gas during galaxy cluster mergers, I will show that there are notable differences between particle and grid based codes, explain their origin and demonstrate work that is been undertaken at Vienna to improve the way in which we model the properties of the ISM.*

Juan Carlos Munoz Cuartas

Title: *The cosmic mass density field reconstruction from the SDSS group catalog*

Authors: *Juan Carlos Munoz-Cuartas, Volker Mueller, Jaime Forero-Romero*

Abstract: *We present the results of the reconstruction of the cosmic mass density field from the SDSS group catalog of Yang et al. (2007). We used a novel technique proposed in Wang et al. (2010) that allows the use of the mass distribution in and around dark matter structures as computed from cosmological simulations to map the mass distribution as traced by groups of galaxies. This method*

enables us to extract natural and mass conservative reconstructions of the density field and avoid the use of arbitrary smoothing functions. We present the results of our reconstruction, the statistics of the density field as well as identifications of structural properties as filaments, sheets, and voids. The reconstructed density fields can be further used in the investigation of environmental dependent galaxy properties and covering fractions of the survey volume by these structure.

Tom Oosterloo

Title: *The evolution of early-type galaxies in different environments: an HI view*

Authors: *Tom Oosterloo*

Abstract: *I will present the results of a deep HI imaging survey of the SAURON sample of early-type galaxies. The HI properties of these galaxies strongly depend on environment. For detection limits of a few times $10^6 M_{\odot}$, HI is detected in more than 50% of the field galaxies, while <10% of the Virgo objects are detected. In about half of the detections, the HI forms a regularly rotating disc or ring. In many galaxies unsettled tails and clouds are seen. All HI discs have counterparts of ionised gas and inner HI discs are also detected in molecular gas. The cold ISM present in the central regions is dominated by molecular gas ($M_{H2}/M_{HI} \sim 10$). We conclude that accretion of small amounts of HI is very common for field early-type galaxies while cluster galaxies do not accrete HI. The few galaxies with a significant young stellar sub-population all have inner gas discs, but for the remaining galaxies there is no trend between stellar population and HI properties. A number of early-type galaxies are very gas rich, but nevertheless have a purely old stellar population. The stellar populations of field galaxies are typically younger than those in Virgo. This is likely related to differences in accretion history.*

Salome Pereira de Matos

Title: *Selection of Luminous Galaxies at the Edge of the Universe*

Authors: *Salome Pereira de Matos*

Abstract : *The study of distant galaxies is crucial for the understanding of the very first stages in galactic evolution, however the criteria to select these objects are numerous. A Australia Telescope Compact Array (ATCA) 1,4 GHz survey, together with Advanced Camera for Surveys (ACS), on board of the Hubble Space Telescope (HST) for the identification of the objects, served the purpose of looking for strongly emitting radio-sources potentially at very high z . These radio-loud galaxies can be promising distant candidates since they can be detected everywhere in the Universe in the current deep radio surveys. The best radio-galaxy candidates may be weakly or even not detected at other wavelengths, hence the identified radio sources in the ATCA survey were also studied in the optical using data from the Galaxy Evolution from Morphology and SEDs (GEMS) survey and the Great Observatories Origins Deep Survey (GOODS) as well as in the Spitzer Wide-area Infrared Extragalactic (SWIRE) survey. Among the 94 radio-sources singled out in the ATCA survey, 14 have an infrared (IR) counterpart, but of those only 7 correspond to an IR galaxy likely emitting two jets at radio frequencies; 40 were within the area covered either by GEMS or GOODS and of those 7 had an optical counterpart and only one was identified in the optical. The results here obtained need further study from deep radio surveys, therefore these radio sources will be singled out for future observations with new telescopes and instruments, such as the Atacama Large Millimetre Array (ALMA).*

Vasiliki Petropoulou

Title: *Evolution of star-forming galaxies in the Hercules cluster: new observational clues of the mass-metallicity relation*

Authors: *Petropoulou V., Vilchez J.M., Papaderos P., Iglesias-Paramo J.*

Abstract: *Spatially resolved spectroscopy has been obtained with the IDS (INT, ORM) and ISIS (WHT, ORM) spectrographs for a sample of 27 star-forming galaxies belonging to the Hercules cluster. The galaxies have been selected from a deep H α survey carried out by our group. Emission-line spectra were corrected from the underlying stellar population continuum emission using the evolutionary code STARLIGHT. Chemical abundances and physical properties of the ionized gas as well as the mean metallicity and age of the underlying stellar component were derived. The information obtained has provided us with new observable clues to analyze the effect of cluster environment on the chemical evolution of galaxies.*

Daniel J. Pisano

Title: *Measuring the halo mass function in loose groups*

Authors: *D.J. Pisano*

Abstract: *The "missing satellite" problem, the absence of sufficient numbers of low mass galaxies as compared to CDM models of galaxy formation, has been well-established for the Local Group for some time. While recent surveys have discovered more faint dwarf galaxies and mitigated this problem, a deficit remains. However, to date the "missing satellite" problem has not been well quantified beyond the Local Group. We report on results from our Parkes HI survey of six loose groups and our determination of the velocity distribution function, a proxy for the halo mass function, in the group environment. We compare our results with determinations of the VDF in other environments and simulations.*

Claes-Erik Rydberg

Title: *Will the James Webb Space Telescope detect population III galaxies?*

Authors: *Claes-Erik Rydberg*

Abstract : *The JWST is the next large space based infrared telescope and is scheduled for launch in 2014. Using a 6.5 meter primary mirror it will probably see the first galaxies. Population III stars are postulated to exist at approximately $z=10-30$. According to current research population III stars are expected to be extremely massive (around 100 solar masses) and hot (around 100,000 K). I calculate the apparent AB-magnitudes for the most luminous population III stars in various JWST filters at $z=10-30$. Atmospheres generated by the TLUSTY code are being used. I assess what this means for the luminosity and AB-magnitudes of the first pristine galaxies consisting of population III stars. The poster shows the estimated apparent AB-magnitudes for the galaxies and stars at different redshifts. Observations of this kind of objects could contribute towards the understanding of galaxy formation in the early universe.*

Luigi Secco

Title: ON GALAXY MASS-RADIUS RELATIONSHIP

Authors: D. Bindoni, L. Secco, E. Contini, R. Caimmi

Abstract : *On the basis of Clausius' virial maximum theory to explain the galaxy Fundamental Plane (FP) (see, e.g., Secco & Bindoni, 2009) a natural explanation follows about the observed relationship between stellar mass and effective radius (M^*-R_e) for the early type galaxies. The main key of this correlation lies on the deep link which has to exist between cosmology and the existence of Fundamental Plane (FP). Without it neither the tilt of FP, nor the main scaling laws for galaxies might find a reason by conserving virial equilibrium together with galaxy homology. The general strategy consists to use the two-component tensor virial theorem (e.g., Brosche et al., 1983; Caimmi & Secco, 1992) to describe the virial configuration of the baryonic component embedded in a DM halo at the end of relaxation phase. In a Λ CDM flat cosmology, starting from variance at equivalence epoch, we derive a theoretical relationship, M^*-R_e , which fits fairly well that extracted from the data of galaxy sample used by Tortora et al. (2009).*

Marilena Spavone

Title: Chemical abundances in the polar disk of NGC4650A: implications for cold accretion scenario

Authors: M. Spavone, E. Iodice, M. Arnaboldi, O. Gerhard, R. Saglia and G. Longo

Abstract : *The aim of the present study is to test whether the cold accretion of gas through a "cosmic filament" (Maccio' et al. 2006) is a possible formation scenario for the polar disk galaxy NGC 4650A. If polar disks form from cold accretion of gas, the abundances of the HII regions may be similar to those of very late-type spiral galaxies, regardless of the presence of a bright central stellar spheroid, with total luminosity of few $10^9 L_\odot$. We use deep long slit spectra obtained with the FORS2 spectrograph at the VLT in the optical and near-infrared wavelength ranges for the brightest HII regions in the disk polar disk of NGC 4650A. The strongest emission lines ([OII] $H\beta$, [OIII], $H\alpha$) were used to derived oxygen abundances, metallicities and the global star formation rates for the disk. The deep spectra available allowed us to measure the Oxygen abundances ($12 + \log(O/H)$) using the "Empirical method" based on intensities of the strongest emission lines, and the "Direct method", based on the determination of the electron temperature from the detection of weak auroral lines, as the [OIII] at 4363 Angstrom. The Oxygen abundance measured for the polar disk is then compared with those measured for different galaxy types of similar total luminosities, and then compared against the predictions of different polar ring formation scenarios. The average metallicity values for the polar disk in NGC 4650A is $Z=0.2 Z_\odot$, and it is lower that the values measured for ordinary spirals of similar luminosity. Moreover the gradient of the metallicity is flat along the polar disk major axis, which implies none or negligible metal enrichment from the stars in the older central spheroid. The low metallicity value in the polar disk NGC 4650A and the flat metallicity gradient are both consistent with a later infall of metal-poor gas, as expected in the cold accretion processes.*

Ignacio Trujillo

Title: *Eleven billion years of massive galaxies evolution*

Authors: *Ignacio Trujillo*

Abstract : *Massive galaxies, presently the main population at the center of the galaxy clusters, were born with different structural properties to what we see today. Eleven billion years ago these galaxies were extremely compact, with sizes around 5 times smaller than what we find today. In this contribution, I will summarize the results obtained by my group in relation to the changes this population has suffered in terms of sizes, velocity dispersions, stellar mass densities profiles and star formation rates. I will discuss the potential evolutionary scenarios these massive compact high- z galaxies have followed and what it is the most likely end for these objects.*

Mattia Vaccari

Title: *Spitzer Extragalactic Representative Volume Survey (SERVS) Early Science*

Authors: *Mattia Vaccari, Mark Lacy, Duncan Farrah & The SERVS Consortium*

Abstract : *We present the Spitzer Extragalactic Representative Volume Survey (SERVS), an 18 deg² medium-deep survey at 3.6 and 4.5 μm with the post-cryogenic Spitzer Space Telescope to $\sim 2 \mu\text{Jy}$ ($AB = 23.1$) depth. SERVS is designed to enable the study of galaxy evolution as a function of environment from $z \sim 1$ to the present day, and is the first extragalactic survey both large enough and deep enough to put rare objects such as luminous quasars and galaxy clusters at $z > \sim 1$ into their cosmological context. SERVS is designed to overlap with several key surveys at optical, near- through far-infrared, submillimeter and radio wavelengths to provide a coherent picture of the formation of massive galaxies. In this talk, we discuss the SERVS data, ancillary data from other surveys in the SERVS fields, outline the main science topics that SERVS will address and present SERVS Early Science results ranging from the IRAC ultra-deep observations of radio sources to the detection of $z \sim 1$ cluster candidates through Voronoi tessellation and Optical/NIR/MIR color selection and the determination of their composite stellar mass function, from the number counts and angular clustering of SERVS sources to IRAC stacking studies aimed at characterizing the environments in which high-redshift QSOs reside.*

Petri Vaisanen

Title: *Environments of strongly star-forming galaxies*

Authors: *Petri Vaisanen, Abiy Tekola*

Abstract: *Not very much is known about the environments of (ultra) luminous infrared galaxies, (U)LIRGs, in the local universe, other than that they are usually interacting or merging systems, and probably avoid the densest clusters. We have correlated the IRAS catalogs with 2MASS and 6dF catalogs to investigate the large scale environments within 2 Mpc of strong IR galaxies, and to find correlations between mass, luminosity, star-formation rate (SFR) and environmental density in these systems. We find that the density around the IR galaxies stays constant with luminosity up to $\log(L_{\text{IR}}/L_{\odot}) = 11$ and then increases with IR luminosity at higher L_{IR} . In this sense (U)LIRGs behave more like*

galaxies at redshift > 1 , and not like the local galaxy population where SFR decreases with density. We also show how at constant mass the environment directly correlates with SFR, and how the ULIRGs appear to have different relations between environment, mass, and SFR than LIRGs and starbursts. (U)LIRGs also have a higher SF efficiency than non-LIRG IR galaxies. Finally, we show that (U)LIRGs live inside halos with masses in a very characteristic range.

Eelco van Kampen

Title: *The environment of early galaxy formation from sub-mm surveys*

Authors: *Eelco van Kampen*

Abstract: *This talk focuses on the early formation of the galaxies in overdense environments (proto-clusters), as observed in various on-going and planned sub-mm surveys. An initial comparison to models will be shown as well.*

Marek Wezgowiec

Title: *An X-ray view of radio polarized ridges in perturbed spiral galaxies*

Authors: *M. Wezgowiec et al.*

Abstract: *Observations of group and cluster galaxies reveal a large variety of interactions between galaxies and with the surrounding medium. The most common evidence for such interactions are asymmetries and distortions of the galactic magnetic field seen in the radio polarized emission. In particular, regions of strong gas compression are often seen as radio polarized ridges. However, using the radio data only it is difficult to conclude whether the ram pressure stripping or tidal interactions are responsible for the perturbations. We present X-ray observations of two perturbed Virgo Cluster galaxies, NGC 4254 and NGC4569, and NGC2276 from NGC2300 galaxy group. We argue that the examination of the hot gas distribution and its spectral analysis, including regions where radio polarized ridges are seen, can help in determination of the nature of disturbances. Higher hot gas temperatures in the position of a polarized ridge would suggest ram pressure effects, what we see in NGC 4569, while in case of tidal effects no rise in the temperature would be seen, as in the southern radio polarized ridge in NGC 4254. NGC2276 seems to incorporate both types of effects.*